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ABSTRACT

This study indicates that the way in which stories are presented to children (verbal versus pictorial) makes little or no difference in the children's comprehension or recall of the stories. Ninety-six kindergarten and second grade children either looked at a series of pictures (and were told they formed a story) or listened to the story through a set of earphones. The experimental conditions were: (1) mode of presentation (pictorial vs. verbal text), (2) free recall vs. probed recall and (3) Story 1 vs. Story 2. The children's comprehension of the stories was tested by their answers to questions asking them to draw inferences from the stories. The story content was ordered using the Stein and Glenn story grammar. The main findings were: (1) there were no reliable differences in either free or probed recall between the two modes of presentation; (2) while free recall of the internal responses or reactions (emotions, motives, etc.) of the story actors was higher in the text condition than in the picture condition, there was not a statistically reliable difference on this measure between conditions in probed recall and (3) there were no reliable differences in comprehension. Slightly higher performance was found on recall of detail and manner in which actions occurred in the picture condition. It is suggested that children encode and retrieve similar amounts and kinds of information about stories in either condition, indicating that they share a common "deep structural" representation. An additional study is briefly described which examined the relative coherence of the two stories. Four tables present descriptions of one of the picture stories and its text equivalent and data from the studies. (Author/BH)

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# How Does the Mode of Presentation Affect Story Comprehension?

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How does the Mode of Presentation Affect Story Comprehension?

In this study, we asked the following question: Do children comprehend a series of events depicted as pictures in ways similar to those described in a verbal narrative? In an attempt to answer this question, we asked kindergarten and second grade children either to view a picture story or listen to a verbal story and then to recall the stories and to answer questions testing their literal or inferential comprehension.

This question was motivated by the possibility that children construct interpretations of stories which are independent of the modality in which they occur. That is, there is a "deep-structure" representation of stories which may be derived from a surface picture or verbal narrative. When a child understands verbal narratives, he or she is assumed to use some schematic organization to assimilate the new information in the narrative. These schemata or "higher order structures" are assumed to guide the child by allowing her or him to set up expectations about what kinds of events and their relations are likely to occur in a story. In a similar manner, in production, the child is assumed to use this knowledge to generate stories which allow the child's listener to use similar schemata (Rumelhart & Ortony, 1977).

Since those experiences which give rise to story schemata are either verbal or visual in nature, one may assume a common mapping between modes or a common underlying representation. That is, one source of story schemata is the hearing of many stories which themselves are ordered regularly so that from the organization of constituents, the child can abstract

events and their relations. An example is the goal, action and consequence sequence which is common and central to stories. Alternatively, the child constructs schemata or scripts from personal experiences which inovke personal goals, actions and outcomes That occur with some frequency in everyday life (Schank, 1975). Thus, event sequences which are experienced directly through one's own eyes or through the words of others may lead to common, underlying representations. If children do construct representations of visual event sequences which correspond to those of a verbal narrative about the same events, then we expect them to recall, infer, and understand these events from different modes in a similar manner.

The picture and verbal stories we compared were equated using recent story grammars as a guide (Mandler & Johnson, 1977; Stein & Glenn, 1979). In particular, we first edited two commercial picture stories (Mercer, 1967; Mercer & Mercer, 1971) into sixteen pictures each. The pictures were chosen so as to compose a well-formed, two episode story. The pictures were selected to show clear settings, events and actions. The goals relating to actions were assumed to be easily inferred and the character's emotional reactions were judged to be rendered well and graphically by the artist.

Following the picture selection, a text was generated for each story. The text followed the rules of the Stein and Glenn (1979) story grammar. The texts, and corresponding picture descriptions and story grammar categories for the Frog story are presented in Table 1.

An examination of Table 1 shows that information relevant to several story grammar categories may be contained in a single picture or that information relevant to a single category of the story grammar may overlap two pictures. These observations illustrate the difficulties in establishing exact equivalence between a picture story and a text (see Baggett, in press, for another approach to establishing equivalence between film slides and a text).

The 96 children were tested individually. Half of them were assigned to the picture condition when the child looked at a set of pictures and was told that they formed a story about "a boy named Mark, his dog named Ruff, and a frog (and, in the Turtle story, a turtle)." In the text condition, the child listened to the story through a set of earphones. Each child heard or saw only one story in one mode. Following the story presentation, the child's memory for the story was tested in one of two ways: free recall or probed recall. Children who were assigned to the free recall test simply told the story as they remembered it; children assigned to the probed recall test answered a series of questions on propositions in the text and on equivalent content in the pictures.

In order to compare recall for pictures with recall for text, we scored the recalls in what we call "meaning units." In Table 1, with the exception of picture 8-9 and 13-14, a meaning unit is the content area covered by one picture. The child was said to have remembered a given meaning unit if the context of his recall includes one element characteristic of that meaning unit. For example, in Table 1, meaning unit #4 might be scored in the picture condition as correct if the child here said, "now

the boy had a pail on his head," or "the frog jumped over the boy's head," or "the boy fell in the water." In the text condition, the child might say, "they fell in the water," or "Mark and Ruff were soaking wet," or "now the frog had jumped away." The probe questions were more directly comparable in that they required nearly identical descriptions of meaning units. There were 17 or 18 probe questions on the story.

In order to show that the free recall protocols were highly similar qualitatively, Table 2 presents what we call a composite protocol which gives expressions for meaning units recalled by 50% or more of the children. The main point of Table 2 is that the children encode and recall the picture sequences in highly similar ways, reporting similar goals, failed attempts, successful consequences and reactions. They differ, however, in certain non-goal related detail for pictures and internal responses or emotional reactions for the text.

Table 3 summarizes several comparisons made on the modality of the event sequences. In addition to free recall and probed recall of meaning units, a set of 8 inference questions on the story were used which required the child to connect events via causal relationships (e.g., Why was the frog lonely?) or fill in missing events or make evaluative inferences (e.g., Was Mark a good frog catcher? How do you know?) or draw implications about spatial relations (e.g., Was Mark's net larger than Ruff?), etc. The set of inferences reflected causal relations (motivational, physical, psychological, or enablements), spatial-temporal relations, or world knowledge inferences taken from the Warren, Nicholas, and Trabasso (1979) taxonomy. Inferences were scored correct if they were plausible and consistent with the story content.

The main findings in Table 3 were that there were no reliable differences for the 48 children each in the free recall or probed recall condition on these measures for picture or text presentation. Likewise, there were no reliable differences for the inferences following either kind of recall.

In order to probe further for content differences, we counted the number of internal responses (feelings, motives, cognitions and emotional reactions) which occurred spontaneously in free recall. While the average number of such responses was small, they occurred twice as often in the text as in the picture condition. Since such internal responses are explicit in the text but must be inferred in the picture condition, this result is not surprising, although it is of interest.

In the probed recall procedure, we asked three questions per story on internal responses. The mean proportion of internal response probe questions answered correctly is shown for each mode of presentation in Table 3. Although the proportion is somewhat higher for the text condition, the difference was not statistically reliable.

The main findings, then, are that the children recalled, either freely or via probes about the same amount of information in terms of meaning units from either the pictures or the text. Furthermore, in subsequent analyses when we have scored the picture recalls from the point of view of text criteria, no reliable modality effects have been found for either kind of recall measure. Children appear to encode and retrieve similar amounts and kinds of information about stories which fit the categories of STORY grammars, suggesting a common "deep structural" representation.

The differences which occured in recall show that pictures may convey the detail and manner in which actions occur better than texts. How Mark fell, how the frog sat or where he found footprints were better recalled from pictures while how Mark felt, how the frog felt, etc. were better conveyed in the text. The latter result showed up in our analysis of internal responses in free but not in probed recall.

One final result is of interest. In examining our Frog and Turtle stories, we noted certain structural differences. The Frog story appeared to us to be more cohesive: it had a clear overriding goal for the main embedded and second episodes (boy wants to catch frog and frog wants to find boy). In the Frog story, all the internal responses are linked to a central purpose, its pursuit, achievement or lack thereof. In the Turtle story, the episodes are without clear goals and are connected by enabling or temporal relations.

In order to operationalize coherence of the stories, we ran a small additional experiment using 26 college students from an Introductory Psychology class. The text stories were divided into statements (26 for the turtle story; 23 for the frog story) and were then scrambled in a random rashion. The 16 pictures for each picture story were also scrambled. The subject's task was to sequence the statements or the pictures in order to form a coherent story. There were 12 or 14 subjects in each condition.

The measure of coherence chosen was the rank correlation between the subject's ordering and our original order. There were no differences between mode of presentation within a story but there were story differences on this measure of coherence. Table 4 shows the relation between the

average correlations and two measures of comprehension for the stories. Of particular interest is the fact that while the stories tended to differ in recall according to their differences in coherence, the recall differences were not statistically reliable. In contrast, the story differences in correct inferences were reliable and correlated with the coherence measures.

In conclusion, the modality of presentation appears to affect the free recall of only certain, selected content but no effect on understanding as measured by probes or inference questions, favoring the idea that the children use a common, underlying representation to encode and retrieve story information, independent of the modality in which the narration occurs (cf. Baggett, in press, for similar conclusions on adults).

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Table 1

Frog Story

(Adapted from Mercer, M. A boy, a dog and a frog. New York: Dial Press, 1967)

| Picture Number, Book Page | Picture Description | Text | Stein & Glenn (1979) Story Grammar (for text) |
|---|---|---|---|
| 1<br>p. 3 | Boy and dog on a hill near a pond Boy holding butterfly net and pail. Smiling frog on the foreground, sitting on a lily pad. | Once there was a boy named Mark, Mark had a dog name Ruff. One day, Mark and Ruff were visiting a pond | Setting |
| | | when they saw a frog sitting in the water. | Initiating Event |
| 2<br>p. 4 | Boy smiling, lifting pail above his shoulder is running down the hill | Mark wanted to catch the frog with his net and pail, | Internal Response (goal) |
| | | so he ran down the hill toward the pond with Ruff. | Attempt |
| 3<br>p. 5 | Boy tripping on branch, dog in the process of falling head first, net and pail up in the air, frog looking towards boy, boy looks surprised. | But they both tripped over a big branch, | Consequence |
| 4<br>p. 8 | Boy and dog in water. Pail on the boy's head, net on the hill. Boy has his arms outstretched towards the frog who is jumping above the boy's head. | and fell into the water. Now they were soaking wet, | Consequence |
| | | and the frog had jumped away. | Reaction |
| 5<br>p. 9 | Back view of boy with hands on his hips, pail on his head still in the water. Dog still in the water also. Smiling frog in the middle of a long branch, facing the boy. | Then Mark saw the frog again, sitting on a big log in the water. | Initiating Event |
| 6<br>P. 11 | Boy, net uplifted, pail on his head on one side of the long branch, dog on the other side, frog in the middle. | He sneaked up with his net behind the frog, and Ruff sneaked up on the other side. | Attempt |
| 7<br>P. 13 | Boy, pail on his head, smiling, has lowered net on the branch. Dog is caught in the net, frog upside down under the branch. | Then Mark swings his net over the frog | Attempt |
| | | but he caught Ruff in the net instead. | Consequence |

Table 1 - Page 2

Frog Story

| Picture Number, Book Page | Picture Description | Text | Stein & Glenn (1979) Story Grammar (for text) |
|---|---|---|---|
| 8<br>pp. 16-17 | Frog on foreground, looking neutral. Boy on the other side, expression unclear, either shaking fist or waving goodbye. | Mark was mad and left the pond with Ruff. | Reaction |
| 9<br>pp. 20-21 | Boy and dog walking away from pond, leaving footprints. Boy looks mad, dog, subdued. | | |
| 10<br>pp. 22-23 | Frog sitting on rock, frowning, all alone in pond, against a backdrop of trees. | Now, the frog was very lonely. | Internal Response |
| 11<br>p. 24 | Frog on the road in the background, footprints and pawprints from the frog to the foreground. | He left the pond and found some footprints on the road. He followed the footprints | Attempt |
| 12<br>p. 25 | Frog in the foreground of living room, footprints on the floor, leading to stairway in background. Net on the floor. | all the way to Mark's house. | |
| 13<br>p. 27 | Frog has gotten on top of the stairs, is in door entrance with big smile. Footprints continue in the room. | and found Mark and Ruff in the bathtub. | Consequence |
| 14<br>p. 28 | Frog is by the bathtub, boy and dog in bathtub look at him, boy smiling | | |
| 15<br>p. 29 | Frog in the process of leaping in the tub. Boy looks happily surprised. | The frog jumped into the bathtub | Reaction |
| 16<br>p. 30 | Boy, smiling, sitting on the edge of the bathtub. Frog, smiling, sitting on the dog's head. | and they were all happy. | |

Table 2

Composite Free Recall Protocols: Statements Typical of Meaning Units Recalled by 50% or More of the Children

Frog Story

| % | Picture Units | % | Text Units |
|---|---|---|---|
| 54 | They were trying to catch the frog | 64 | Mark wanted to catch the frog |
| 73 | And they fell in the water | 55 | He fell in the water |
| 55 | The boy had a pail on his head | - | |
| 55 | And the frog jumped on a log | - | |
| 55 | The boy caught his dog in the net instead | 64 | He caught Ruff in the net |
| 73 | They went home (and took a bath) | 64 | And then, they went home |
| - | | 64 | The frog was lonely |
| 91 | The frog followed the footprints | 55 | He followed the footprints |
| 64 | into the house | - | |
| 100 | He saw them in the bathtub | 100 | And found Mark in the bathtub |
| 73 | He jumped in the bathtub with them | 55 | They were all happy |

Table 3

Summary of Comparisons on Event Sequence Modality

| | Modality | | |
|---|---|---|---|
| | Picture | Text | F-value |
| Proportion Propositions Recalled | | | |
| Free Recall | .514 | .497 | < 1 |
| Probed Recall | .868 | .844 | < 1 |
| All Ss | .706 | .698 | < 1 |
| Proportion Inferences | | | |
| Free Recall | .573 | .589 | < 1 |
| Probed Recall | .620 | .677 | 1.2 |
| All Ss | .596 | .632 | < 1 |
| Number of Internal Responses | | | |
| Free Recall | .667 | 1.417 | 10.38** |
| Proportion Internal Responses | | | |
| Probed Recall | .733 | .830 | 2.18 |

** $p < .01$

Table 4

Relationship Between Free Recall of Text, Inferences and Coherence of Stories

| Story | Proportion Proposition Free Recall | Proportion Inferences | Average Correlation of S's Construction With Event Sequence |
|---|---|---|---|
| Frog | .551 | .672 | .90 |
| Turtle | .461 | .557 | .69 |
| F(1,80) | 1.36 | 6.62* | 5.32* |

*P < .05